Project Introduction

Balcones Technologies, LLC proposes to adapt actively controlled suspension technology developed by The University of Texas at Austin Center for Electromechanics (CEM) for high performance off-road vehicles to address STTR 2009-1 Subtopic T1.02, Information Technologies for Intelligent Planetary Robots. In particular, our team will develop a concept design for an actively controlled ElectroMechanical Suspension (EMS) system, including algorithms, software and hardware, that dramatically improves mobility for MER to MSL scale rovers. Our system exploits and adapts approximately $25M of highly successful active suspension R&D at CEM since 1993. It also exploits CEM's experience developing electromechanical systems for space applications gained during NASA funded programs to develop flywheel energy storage system technology for the International Space Station. Finally, it exploits our team's extensive experience migrating University technology to commercially viable manufacturable products. Relevant features of our anticipated solution include: \ Capable of vehicle speeds exceeding 3 m/s over lunar relevant terrain while maintaining hyper-stability for payloads of 100 kg or more \ Large suspension travel to enable obstacle negotiation \ Control system that can operate autonomously or slaved to higher level vehicle controller for specialized operations such as obstacle negotiation \ Four quadrant actuator control, capable of power regeneration for damping operations to improve system efficiency \ Passive springs to support rover static weight (no power consumption to support static weight) \ Highly efficient electromechanical suspension actuators for each wheel station, individually sized to support a high proportion of vehicle mass to enable obstacle negotiation \ Modular control system, based on our highly successful control system for terrestrial manned and unmanned vehicles \ Scalable technology for rover sizes representative of MER to MSL rovers

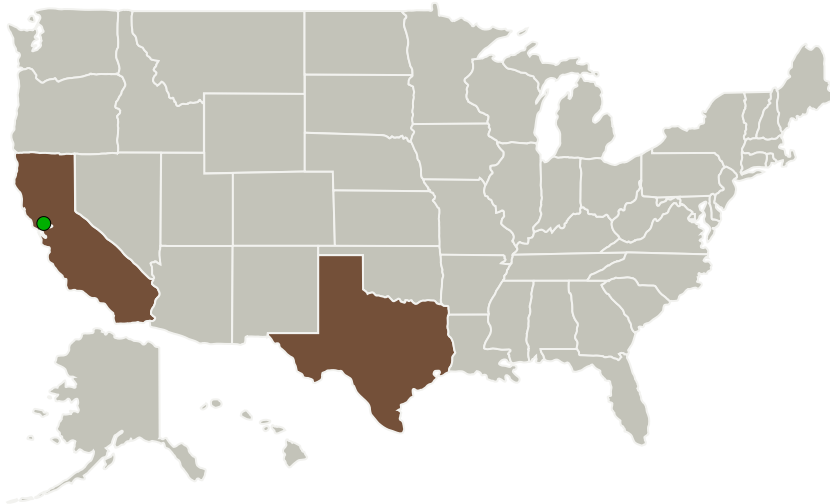Active Electromechanical Suspension System for Planetary Rovers, Phase I

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For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/10298

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
Balcones Technologies, LLC	Lead Organization	Industry	Austin, Texas
⬤ Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
University of Texas - Center for Electromechanics	Supporting Organization	Academia	Austin, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

▶ **January 2010:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Balcones Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

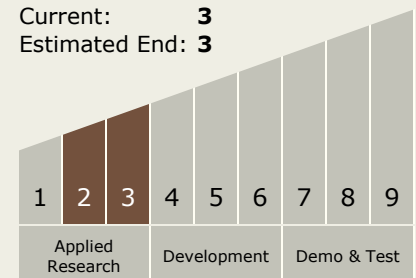**Program Director:**

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joseph H Beno

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**

1	2	3	4	5	6	7	8	9
		Applied Research		Development			Demo & Test	

✅ **January 2011:** Closed out

Closeout Documentation:
- Final Summary Chart*(https://techport.nasa.gov/file/138767)*

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  └ TX03.2 Energy Storage
    └ TX03.2.3 Advanced Concepts for Energy Storage

Target Destinations
The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System